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DEC 19 1994

Dear Sir or Ms.,

FCC MAIL ROOM

16-December-1994

1 ET.
Enclosed, please find a reply to Docket 94-32, NPRM 94-272.
I've enclosed 15 copies, please distribute them to all of the
commissioners and other interested parties within FCC.

Would you be able to notify me that you've received and distributed
this information? E-mail to Bruce@Pixar.com, a phone message to
510-215-3502, or a postcard to the above address would be fine.

Many Thanks



Bruce Perens
Northern California Packet Association

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of)	
)	
Allocation of Spectrum Below)	ET Docket No. 94-32
5 GHz Transferred from)	
Federal Government Use)	

COMMENT OF THE NORTHERN CALIFORNIA PACKET ASSOCIATION

Submitted by: Bruce Perens
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Date of Submission: December 19, 1994

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I. INTRODUCTION

1. Northern California Packet Association represents Radio Amateur packet radio operators in the Northern California area.
2. This response to FCC 94-272 (docket 94-32) contests assumptions made by Department of Commerce and FCC regarding the prospective impact upon the Amateur Radio Service of the reallocation of the 2390-2400 and 2402-2417 MHz bands from Government to the private sector.
3. In addition, we present regulatory impediments that to date have hindered utilization of the 2390-2417 MHz frequency band by Radio Amateurs for experimentation in digital computer networking technology. Utilization of this band by radio amateurs for digital networking would have been much greater but for these regulatory impediments. Thus, we submit that current assumptions of low use of this band by Radio Amateurs are more a gauge of the effectiveness of over-government in depressing spectrum use than they are estimates of the potential for spectrum use by Radio Amateurs.
4. We propose changes that could be made to permit Radio Amateurs to be more effective contributors to the continued growth and development of advanced communications and technologies and in education, thus creating new high technology jobs and economic growth.
5. We consider the prospective favorable economic impact of a higher priority for Education as a frequency user, and the mission that Amateur Radio could perform in education.
6. We point out an area of the spectrum where unused frequencies are available.
7. We comment on the need for Amateurs to have primary allocation or equal status with other services in the bands that they are allocated, and point out current problems that have locked Amateurs and Part-15

users out of 902-928 MHz in some urban areas.

II. BACKGROUND

1. FCC proposes to re-allocate two band segments: 2390-2400 MHz and 2402-2417 MHz.
2. Currently, 2390-2400 MHz is allocated on a primary basis to Government use, and on a secondary basis to Radio Amateurs. FCC proposes to transfer primary allocation of 2390-2400 MHz to private sector uses. This transfer may remove the secondary allocation to the Amateur Service, may reduce access to the band to Amateur operations because of the need to protect a new primary user from interference, or may make the allocation to the Amateur Service less useful due to an increase in harmful interference that must be tolerated by Amateurs.
3. The real primary users of 2400-2450 MHz are millions of microwave ovens that are permitted to operate in the 2400-2500 MHz Industrial, Scientific, and Medical (ISM) band. On paper, the 2400-2450 MHz band is allocated on a primary basis to government, and on a secondary basis to Radio Amateurs. However, both Government and Amateurs must accept harmful interference from ISM devices. The leakage limits on home microwave ovens prevent physical injury from their emissions, but these limits allow more than enough emissions to make the ovens powerful jammers of communications.
4. 2400-2483.5 MHz is also authorized for use by Part-15 (license free) devices. While these devices are required to protect Radio Amateurs from harmful interference, the reality is that protection of Radio Amateurs from Part-15 devices is rarely enforced. Commercial forces rather than the policy of FCC prevent this enforcement: if an Amateur and a Part-15 commercial installation are in conflict at a site such as a shared antenna tower or an urban building, the site's landlord will generally evict the Amateur rather than lose the business of the Part-15 commercial user. FCC's depleted enforcement budget also contributes to a lack of protection of Amateurs from Part-15 devices.
5. FCC proposes to transfer primary allocation of 2402-2417 MHz from government to private sector uses. This transfer may remove the secondary allocation to the Amateur Service, may reduce availability of the band to Amateur operations because of the need to protect a new primary user from interference, or may make the allocation to the Amateur Service less useful due to an increase in harmful interference that must be tolerated by Amateurs.

III. DISCUSSION

1. The conflicting authorizations in the 2400-2450 MHz band make it impractical for use by Radio Amateurs in digital networking over land paths of 5-50 miles where interfering devices may be in the path between two stations. 2400-2450 is still useful for space-to-ground communications, because highly directional antennas can be used to eliminate interference from ground-based devices. 2400-2450 is also still useful for very-short-range communications such as building-wide networks of Part-15 or Amateur devices, where interference can be surmounted by increased signal strength.
2. The conflicting authorizations in 2400-2450 MHz make 2390-2400 MHz the only practical band-segment for networking over land paths of 5-50 miles. Thus, FCC and Department of Commerce should consider that the availability of the 2390-2400 MHz band in its presently "quieter" state has a significantly greater impact for Radio Amateurs

than the availability of an equal-sized sub-band of 2402-2450 MHz.

3. FCC and Department of Commerce erred when they assumed that the remaining band segments of 2400-2402 and 2417-2450 MHz would be sufficient for Amateur use. Their error was that they did not take into account that the conflicting authorizations in these band segments make them impractical for communications over land paths of 5-50 miles because of the potential for interfering devices to lie in the path between two stations. The assumption might have been correct if the only Amateur uses for this band were space-to-ground and very-short-range communications.
4. FCC and Department of Commerce have requested information on present and predicted occupancy of 2300-2310 MHz, 2390-2400 MHz, and 2402-2417 MHz by Radio Amateurs. The primary use we see for these band segments is digital computer networking. We observe that current regulation (certain elements of Part 97) has a depressing effect on the use of digital computer networking by Radio Amateurs. Relief from this regulation would result in greatly increased utilization of digital networking, and thus of the band segments under discussion, by Radio Amateurs. Thus, we question the utility of surveys of present and future occupancy that do not take into account the potential of increased utilization of the Amateur Service due to changes in regulation.
5. To support our argument, we shall go over elements of Part 97 that we propose could be changed to encourage use of digital computer networking by Radio Amateurs, and would thus remove factors that currently depress utilization of the 2390-2450 MHz band. We propose that increased involvement of Radio Amateurs in digital computer networking would have a positive impact on the United States economy because it would encourage development of new software and algorithms for computer networking, and would facilitate education in all technologies that are used in implementing and operating computer networks. We understand that the Commission may see this material as outside the scope of the NPRM, and may prefer for these proposals to be presented in a different form before they are considered. If that is the case, we request that they be considered at present only for their prospective impact on the increase of Radio Amateur utilization the 2300-2450 MHz frequency spectrum.
- 5a. 97.111(5) prohibits Radio Amateurs from carrying out "Communications, on a regular basis, which could reasonably be furnished alternatively through other radio services". We submit that this restriction is so broad that it could be interpreted as a ban upon an Amateur Radio digital communications network in the presence of other wireless networks, even networks of Part-15 devices. We surmise that this restriction may have been designed to protect a regulated monopoly that no longer exists.
- 5b. 97.111(6) prohibits broadcasting in general, and allows broadcasting of information that is of interest only to Radio Amateurs. We observe that a major mode of discussion on digital computer networks such as the Internet is called "Usenet", "Net-News" or the computer "bulletin board". Net-News and bulletin board discussions take the form of a broadcast message posted by one of the participants, after which other participants respond to the message by posting broadcast messages that continue the thread of argument on the same topic. While the messages are broadcast, they implement a round-table discussion. We submit that in the case of digital computer networks, broadcasting or not broadcasting is a technical communications protocol choice and does not have the same meaning that it has for broadcast voice communications. We request that FCC allow any subject that could be legally discussed without broadcasting to be discussed via a broadcast communications protocol on an Amateur Radio digital computer network.

- 5c. We ask FCC to recognize that a primary role of stations in a digital computer network is to move third-party information automatically. Much of the restriction that currently hampers the deployment of Amateur Radio digital computer networks is related to third-party messages and automatic operation while such messages are carried.
- 5d. 97.115(2) prohibits carriage of messages for a third party in another country unless that country has signed a third-party treaty with the United States. We request that FCC treat automatic digital message forwarding between UHF-band Amateur stations within the borders of the United States as domestic communications. We observe that third-party communications from nations with which no third-party treaty exists can enter the United States via another communications service than Amateur Radio, such as the Internet. We observe that there is no such third-party limitation on domestic services such as Cellular Radio Telephone, and that the Internet (the international network in which the National Information Infrastructure is our domestic component) has no prohibition upon communications between nations enforced upon it at all. We surmise that these third-party regulations were drafted to regulate short-wave communications of international range, not UHF domestic communications between two computers in a network, and that they were drafted in a vastly different technological and political climate than today. We understand that international treaties that are difficult to change are involved, and thus request that FCC work out a means of permitting these third-party communications to be transmitted between domestic amateur stations in a UHF digital network once the messages have already entered the United States. We currently find it very difficult, in the context of border-free international networks such as the Internet, to operate the domestic Amateur Radio computer network as if certain nations did not exist.
- 5e. 97.109(e) requires the AX.25 protocol for automatic control of a station while transmitting third-party communications. This requirement has the unfortunate effect of prohibiting Radio Amateurs from converting surplus commercial radio data transceivers for use in an automatic-forwarding network, since such equipment is based on microcontroller firmware that rarely implements the AX.25 protocol. In theory, the firmware program of the equipment could be re-written to use AX.25. In practice, this is almost never possible due to the in-availability of the source code for modification by Radio Amateurs, or the storage of the firmware in such a way that it can not be modified without destroying the equipment. We observe that the AX.25 standard specified was designed in the early eighties, and the last version was released in 1984. It is now quite antique by the standards of computer software. We understand that this regulation was to make it possible for FCC to monitor Amateur Radio digital communications at a time when FCC owned little equipment for doing so. We urge the FCC to provide for the use of generally accepted computer networking protocols. For example, the protocols released by the Internet Engineering Task Force (the engineers of the National Information Infrastructure) should be allowed for use in automatic forwarding via Amateur Radio. Other protocols should be allowed as well. We suggest that FCC require only that the protocol provide for unambiguous identification of the communicating stations and the communications protocol, and that the details of any protocol be filed with FCC before that protocol may be used for automatic third-party forwarding.
- 5f. 97.311 restricts the modulation method of a station transmitting spread-spectrum emissions to a very few simple forms. This requirement has the unfortunate effect of prohibiting Radio Amateurs from converting surplus commercial spread spectrum radio modems for use on Amateur Radio, since it is very unlikely that those

modems could be programmed to use one of the few spreading protocols that FCC allows Radio Amateurs. It also has the effect of banning experimental research on new spread-spectrum techniques by Radio Amateurs, who could potentially contribute much new art in this area. We understand that this regulation was to make it possible for FCC and other government agencies to monitor spread-spectrum communications at a time when they owned little equipment for doing so. We surmise that this regulation could also have been influenced by cold-war national security considerations that may no longer apply. Many of us have purchased surplus Part-15 spread-spectrum radio modems that we would convert to Amateur use if we were permitted to use the spreading schemes of those modems on the Amateur bands. We suggest that FCC require only that the details of the protocol be filed with FCC before that protocol may be used, and that a station keep accurate logs of the spreading protocols used and the dates upon which use of those protocols was initiated and terminated.

- 5g. 97.1(b) states one of the purposes of the Amateur Radio Service is "Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art." Since much of what the Radio Amateur has to contribute today is Computer Science (in the form of software and algorithms for digital computer networking), we ask that FCC make it easier for us to justify the mission of Amateur Radio digital computer networks by substituting the more general word "technology" for "radio art" in 97.1(b).
- 5h. 97.1(d) states one of the purposes of the Amateur Radio Service is "Expansion of the existing reservoir within the amateur community of trained operators, technicians, and electronics experts." So that we can more easily justify the mission of Amateur Radio digital computer networks, we ask that the more general language "experts in science and technology" could be substituted for "technicians and electronics experts" in 97.1(d). Again, this more general language would include the field of Computer Science.
- 5i. We request an explicit statement in 97.1 of Amateur Radio's mission in education, and its mission to encourage young people to explore careers in science and technology. We submit that this is one of the primary missions of Amateur Radio digital computer networking as well as Amateur Radio as a whole, and a mission of tremendous economic value to the United States.
6. If the changes in 5a through 5i (above) were enacted, we would see an increase in the use of Amateur Radio for digital computer networking, a corresponding increase in experimentation and software development for digital computer networking by Radio Amateurs, and an increase in the utilization of amateur UHF spectrum for digital computer networking. Since software development is one of the technologies where individuals working in their spare time without the backing of large laboratories can still make a large contribution, this would result in increased growth and development of advanced digital computer networking technology, thereby creating new high technology jobs and economic growth. We'd also like to point out that increased involvement by Radio Amateurs in digital computer networking would lead to increased educational opportunities for young people in these technologies.
7. The reason proposed for the transfer of this spectrum from Government to the private sector is economic benefit. We observe that the NPRM makes little mention of the potential for Education to be allocated a higher priority as a spectrum user. We suggest that a higher priority for Education would result in a larger, longer-term and more sustained economic benefit than the short-term benefit of funds from a frequency auction and employment

of the frequencies for such cost-shaving optimizations as the replacement of copper local loops for "land-line" telephone companies. If the United States is to maintain its economic competitiveness, it needs to encourage more students to go into careers in science and technology. We suggest that the Amateur Radio service is an ideal vehicle for employment of this spectrum in education. There is considerable evidence for the role of Amateur Radio in a student's choice to make a career as a scientist or engineer. In addition, the accessibility of Amateur Radio to students should be considered: In any networking environment except for the Amateur service, equipment such as a network gateway would be kept locked away in a computer room and tended only by professional computer system administrators. In an Amateur Radio network, anyone can operate a network gateway that is available to a large user community, and thus anyone can learn about one. The same goes for networking hardware - only in the amateur service is a student not limited to extremely low power or pre-built type-approved equipment. An Amateur Radio network is also more permissive of applications that could be too expensive for a student to carry out on a commercial network, or could be disallowed by a commercial network operator.

8. If FCC and Department of Commerce are still looking for spectrum, we suggest they consider the extremely low utilization of the UHF television channels. Part of the reason for this low utilization is that the mission of these channels has been usurped by cable and by direct satellite broadcasting. Another reason is that until recently, poor implementation of receiver tuners prohibited the allocation of stations in an urban area with less than five channels of separation from each other. Rather than a broad transfer in allocation, we suggest that other services than television be granted access to currently-unallocated UHF television channels on a region-by-region basis.
9. A secondary allocation for the Amateur service is sometimes little better than no allocation at all. As an example of this, we offer a current unfortunate situation of Amateurs being overly restricted by the primary user in another band. Amateurs and users of Part-15 equipment are being locked out of the 902-928 band in urban areas by the primary user, the Automatic Vehicle Monitoring service. We observe that the technology of differential global positioning system receivers and the cellular telephone network has obsoleted the technology used by AVM. However, AVM operators persist in restricting Amateur operations to two 1 MHz sub-bands at the band-edge or even no operation at all. AVM operators severely restrict or attempt to make a total prohibition on operation of Part-15 devices within their shared spectrum. Education was to be a large user of Part-15 and Amateur devices in the 902-928 band, but is being restricted from these uses in the urban areas where they are most needed. We do not wish to see this same situation take place in the 2300-2450 MHz bands. We plead with FCC to look to the needs of Educational users in the 902-928 and 2300-2450 MHz bands.

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